

**证 明**  
**CERTIFICATE**

03150016

本证明之附件是向中国专利局作为受理局提交的下列国际申请副本  
**THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY OF THE**  
**BELOW**  
**IDENTIFIED INTERNATIONAL APPLICATION THAT WAS FILED WITH THE**  
**CHINESE PATENT OFFICE AS RECEIVING OFFICE**

国 际 申 请 号: PCT/CN03/00339

INTERNATIONAL APPLICATION NUMBER


国 际 申 请 日: 12 MAY 2003(12.05.03)

INTERNATILNAL FILING DATE

发 明 名 称 : SYSTEM AND METHOD FOR EDGE BLENDING

TITLE OF INVENTION

HARD DRIVE HEAD SLIDERS



中华人民共和国国家知识产权局局长

**COMMISSIONER OF THE STATE INTELLECTUAL PROPERTY**  
**OFFECE OF THE PEOPLE'S REPUBLIC OF CHINA**

王 荣 川

二零零三年七月十五日

JULY 15, 2003

PCT

## REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

PCT/CN 03/00339

International Application No.

12 MAY 2003 (12.05.03)

International Filing Date

RO/CN 中华人民共和国国家知识产权局  
PCT International Application

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference  
(if desired) (12 characters maximum) FP03150016

<b>Box No. I TITLE OF INVENTION</b>	
SYSTEM AND METHOD FOR EDGE BLENDING HARD DRIVE HEAD SLIDERS	
<b>Box No. II APPLICANT</b> <input type="checkbox"/> This person is also inventor	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)	Telephone No.
SAE MAGNETICS (H. K. ) LTD. SAE Tower, 38-42 Kwai Fung Crescent Kwai Chung N. T. Hong Kong Special Administrative Region, P. R. of China	Facsimile No.
	Teleprinter No.
	Applicant's registration No. with the Office
State (that is, country) of nationality: CN	State (that is, country) of residence: CN
This person is applicant for the purposes of: <input checked="" type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
<b>Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)</b>	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)	This person is:
ZHAN, Zhujian WINNERWAY INDUSTRIAL AREA, NANCHENG, DONGGUAN CITY, GUANGDONG PROVINCE, P.R. CHINA Zip Code: 511700	<input type="checkbox"/> applicant only <input type="checkbox"/> applicant and inventor <input checked="" type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.)
	Applicant's registration No. with the Office
State (that is, country) of nationality:	State (that is, country) of residence:
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
<input checked="" type="checkbox"/> Further applicants and/or (further) inventors are indicated on a continuation sheet.	
<b>Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE</b>	
The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: <input checked="" type="checkbox"/> agent <input type="checkbox"/> common representative	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)	Telephone No.
CHINA PATENT AGENT (H.K.) LTD. 22/F, Great Eagle Centre 23 Harbour Road, Wanchai Hong Kong Special Administrative Region The People's Republic of China	(852)28284688
	Facsimile No.
	(852)28271018
	Teleprinter No.
	Agent's registration No. with the Office
<input type="checkbox"/> Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.	

Sheet No. ...2...

Continuation of Box No. III <b>FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)</b>	
<i>If none of the following sub-boxes is used, this sheet should not be included in the request.</i>	
Name and address: <i>(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</i> FUJII, Ryuji c/o SAE Magnetics (H.K.) Ltd. SAE Tower 38-42, Kwai Fung Crescent Kwai Chung, N. T. Hong Kong Special Administrative Region P. R. of China	This person is: <input type="checkbox"/> applicant only <input type="checkbox"/> applicant and inventor <input checked="" type="checkbox"/> inventor only <i>(If this check-box is marked, do not fill in below.)</i> Applicant's registration No. with the Office
State <i>(that is, country)</i> of nationality:	State <i>(that is, country)</i> of residence:
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
Name and address: <i>(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</i> WANG, Quanbao WINNERWAY INDUSTRIAL AREA, NANCHENG, DONGGUAN CITY, GUANGDONG PROVINCE, P.R. CHINA    Zip Code: 511700	This person is: <input type="checkbox"/> applicant only <input type="checkbox"/> applicant and inventor <input checked="" type="checkbox"/> inventor only <i>(If this check-box is marked, do not fill in below.)</i> Applicant's registration No. with the Office
State <i>(that is, country)</i> of nationality:	State <i>(that is, country)</i> of residence:
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
Name and address: <i>(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</i> MAHADEV, Niraj c/o SAE Magnetics (H.K.) Ltd. SAE Tower 38-42, Kwai Fung Crescent Kwai Chung, N. T. Hong Kong Special Administrative Region P. R. of China	This person is: <input type="checkbox"/> applicant only <input type="checkbox"/> applicant and inventor <input checked="" type="checkbox"/> inventor only <i>(If this check-box is marked, do not fill in below.)</i> Applicant's registration No. with the Office
State <i>(that is, country)</i> of nationality:	State <i>(that is, country)</i> of residence:
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
Name and address: <i>(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</i> YASUDA, Charlie c/o SAE Magnetics (H.K.) Ltd. SAE Tower 38-42, Kwai Fung Crescent Kwai Chung, N. T. Hong Kong Special Administrative Region P. R. of China	This person is: <input type="checkbox"/> applicant only <input type="checkbox"/> applicant and inventor <input checked="" type="checkbox"/> inventor only <i>(If this check-box is marked, do not fill in below.)</i> Applicant's registration No. with the Office
State <i>(that is, country)</i> of nationality:	State <i>(that is, country)</i> of residence:
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
<input type="checkbox"/> Further applicants and/or (further) inventors are indicated on another continuation sheet.	

Sheet No. ...3...

**Box No. V DESIGNATION OF STATES**

Mark the applicable check-boxes below; at least one must be marked.

The following designations are hereby made under Rule 4.9(a):

**Regional Patent**

- ☐ **AP ARIPO Patent:** GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, MZ Mozambique, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZM Zambia, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT (if other kind of protection or treatment desired, specify on dotted line) .....
- ☐ **EA Eurasian Patent:** AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☐ **EP European Patent:** AT Austria, BE Belgium, BG Bulgaria, CH & LI Switzerland and Liechtenstein, CY Cyprus, CZ Czech Republic, DE Germany, DK Denmark, EE Estonia, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, SK Slovakia, TR Turkey, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☐ **OA OAPI Patent:** BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GQ Equatorial Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line) .....

**National Patent (if other kind of protection or treatment desired, specify on dotted line):**

- |  |   |   |
|--|---|---|
| <input type="checkbox"/> AE United Arab Emirates .....               | <input type="checkbox"/> GM Gambia .....                                    | <input type="checkbox"/> NZ New Zealand .....                 |
| <input type="checkbox"/> AG Antigua and Barbuda .....                | <input type="checkbox"/> HR Croatia .....                                   | <input type="checkbox"/> OM Oman .....                        |
| <input type="checkbox"/> AL Albania .....                            | <input type="checkbox"/> HU Hungary .....                                   | <input type="checkbox"/> PH Philippines .....                 |
| <input type="checkbox"/> AM Armenia .....                            | <input type="checkbox"/> ID Indonesia .....                                 | <input type="checkbox"/> PL Poland .....                      |
| <input type="checkbox"/> AT Austria .....                            | <input type="checkbox"/> IL Israel .....                                    | <input type="checkbox"/> PT Portugal .....                    |
| <input type="checkbox"/> AU Australia .....                          | <input type="checkbox"/> IN India .....                                     | <input type="checkbox"/> RO Romania .....                     |
| <input type="checkbox"/> AZ Azerbaijan .....                         | <input type="checkbox"/> IS Iceland .....                                   | <input type="checkbox"/> RU Russian Federation .....          |
| <input type="checkbox"/> BA Bosnia and Herzegovina .....             | <input type="checkbox"/> JP Japan .....                                     |   |
| <input type="checkbox"/> BB Barbados .....                           | <input type="checkbox"/> KE Kenya .....                                     | <input type="checkbox"/> SD Sudan .....                       |
| <input type="checkbox"/> BG Bulgaria .....                           | <input type="checkbox"/> KG Kyrgyzstan .....                                | <input type="checkbox"/> SE Sweden .....                      |
| <input type="checkbox"/> BR Brazil .....                             | <input type="checkbox"/> KP Democratic People's Republic of Korea .....     | <input type="checkbox"/> SG Singapore .....                   |
| <input type="checkbox"/> BY Belarus .....                            | <input type="checkbox"/> KR Republic of Korea .....                         | <input type="checkbox"/> SI Slovenia .....                    |
| <input type="checkbox"/> BZ Belize .....                             | <input type="checkbox"/> KZ Kazakhstan .....                                | <input type="checkbox"/> SK Slovakia .....                    |
| <input type="checkbox"/> CA Canada .....                             | <input type="checkbox"/> LC Saint Lucia .....                               | <input type="checkbox"/> SL Sierra Leone .....                |
| <input type="checkbox"/> CH & LI Switzerland and Liechtenstein ..... | <input type="checkbox"/> LK Sri Lanka .....                                 | <input type="checkbox"/> TJ Tajikistan .....                  |
| <input checked="" type="checkbox"/> CN China .....                   | <input type="checkbox"/> LR Liberia .....                                   | <input type="checkbox"/> TM Turkmenistan .....                |
| <input type="checkbox"/> CO Colombia .....                           | <input type="checkbox"/> LS Lesotho .....                                   | <input type="checkbox"/> TN Tunisia .....                     |
| <input type="checkbox"/> CR Costa Rica .....                         | <input type="checkbox"/> LT Lithuania .....                                 | <input type="checkbox"/> TR Turkey .....                      |
| <input type="checkbox"/> CU Cuba .....                               | <input type="checkbox"/> LU Luxembourg .....                                | <input type="checkbox"/> TT Trinidad and Tobago .....         |
| <input type="checkbox"/> CZ Czech Republic .....                     | <input type="checkbox"/> LV Latvia .....                                    |   |
| <input type="checkbox"/> DE Germany .....                            | <input type="checkbox"/> MA Morocco .....                                   | <input type="checkbox"/> TZ United Republic of Tanzania ..... |
| <input type="checkbox"/> DK Denmark .....                            | <input type="checkbox"/> MD Republic of Moldova .....                       | <input type="checkbox"/> UA Ukraine .....                     |
| <input type="checkbox"/> DM Dominica .....                           |   | <input type="checkbox"/> UG Uganda .....                      |
| <input type="checkbox"/> DZ Algeria .....                            | <input type="checkbox"/> MG Madagascar .....                                | <input type="checkbox"/> US United States of America .....    |
| <input type="checkbox"/> EC Ecuador .....                            | <input type="checkbox"/> MK The former Yugoslav Republic of Macedonia ..... |   |
| <input type="checkbox"/> EE Estonia .....                            | <input type="checkbox"/> MN Mongolia .....                                  | <input type="checkbox"/> UZ Uzbekistan .....                  |
| <input type="checkbox"/> ES Spain .....                              | <input type="checkbox"/> MW Malawi .....                                    | <input type="checkbox"/> VN Viet Nam .....                    |
| <input type="checkbox"/> FI Finland .....                            | <input type="checkbox"/> MX Mexico .....                                    | <input type="checkbox"/> YU Yugoslavia .....                  |
| <input type="checkbox"/> GB United Kingdom .....                     | <input type="checkbox"/> MZ Mozambique .....                                | <input type="checkbox"/> ZA South Africa .....                |
| <input type="checkbox"/> GD Grenada .....                            | <input type="checkbox"/> NO Norway .....                                    | <input type="checkbox"/> ZM Zambia .....                      |
| <input type="checkbox"/> GE Georgia .....                            |   | <input type="checkbox"/> ZW Zimbabwe .....                    |
| <input type="checkbox"/> GH Ghana .....                              |   |   |

Check-boxes below reserved for designating States which have become party to the PCT after issuance of this sheet:

- |                                |                                |                                |
|--------------------------------|--------------------------------|--------------------------------|
| <input type="checkbox"/> ..... | <input type="checkbox"/> ..... | <input type="checkbox"/> ..... |
| <input type="checkbox"/> ..... | <input type="checkbox"/> ..... | <input type="checkbox"/> ..... |

**Precautionary Designation Statement:** In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)

Sheet No. ...4...

**Box No. VI PRIORITY CLAIM**

The priority of the following earlier application(s) is hereby claimed:

Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country or Member of WTO	regional application:* regional Office	international application: receiving Office
item (1)				
item (2)				
item (3)				
item (4)				
item (5)				

☐ Further priority claims are indicated in the Supplemental Box.

The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of this international application is the receiving Office) identified above as:

☐ all items    ☐ item (1)    ☐ item (2)    ☐ item (3)    ☐ item (4)    ☐ item (5)    ☐ other, see Supplemental Box

\* Where the earlier application is an ARIPO application, indicate at least one country party to the Paris Convention for the Protection of Industrial Property or one Member of the World Trade Organization for which that earlier application was filed (Rule 4.10(b)(ii)): ....

**Box No. VII INTERNATIONAL SEARCHING AUTHORITY**

Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):

ISA / .. CN .....

Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):

Date (day/month/year)

Number

Country (or regional Office)


**Box No. VIII DECLARATIONS**

The following declarations are contained in Boxes Nos. VIII (i) to (v) (mark the applicable check-boxes below and indicate in the right column the number of each type of declaration):

Number of  
declarations

- |   |  |   |
|---|--|---|
| <input type="checkbox"/> Box No. VIII (i)   | Declaration as to the identity of the inventor   | : |
| <input type="checkbox"/> Box No. VIII (ii)  | Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent             | : |
| <input type="checkbox"/> Box No. VIII (iii) | Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application | : |
| <input type="checkbox"/> Box No. VIII (iv)  | Declaration of inventorship (only for the purposes of the designation of the United States of America)                               | : |
| <input type="checkbox"/> Box No. VIII (v)   | Declaration as to non-prejudicial disclosures or exceptions to lack of novelty   | : |

Sheet No. ...5...

Box No. IX CHECK LIST; LANGUAGE OF FILING																											
<p>This international application contains:</p> <p>(a) the following number of sheets in paper form:</p> <p style="margin-left: 20px;">request (including declaration sheets) : 5</p> <p style="margin-left: 20px;">description (excluding sequence listing part) : 6</p> <p style="margin-left: 20px;">claims : 5</p> <p style="margin-left: 20px;">abstract : 1</p> <p style="margin-left: 20px;">drawings : 10</p> <p style="margin-left: 20px;">Sub-total number of sheets : 27</p> <p style="margin-left: 20px;">sequence listing part of description (actual number of sheets if filed in paper form, whether or not also filed in computer readable form; see (b) below) : _____</p> <p style="margin-left: 20px;">Total number of sheets : 27</p> <p>(b) sequence listing part of description filed in computer readable form</p> <p style="margin-left: 20px;">(i) <input type="checkbox"/> only (under Section 801(a)(i))</p> <p style="margin-left: 20px;">(ii) <input type="checkbox"/> in addition to being filed in paper form (under Section 801(a)(ii))</p> <p style="margin-left: 20px;">Type and number of carriers (diskette, CD-ROM, CD-R or other) on which the sequence listing part is contained (additional copies to be indicated under item 9(ii), in right column): _____</p>	<p>This international application is accompanied by the following item(s) (mark the applicable check-boxes below and indicate in right column the number of each item):</p> <table style="width: 100%;"> <tr> <td style="width: 80%;">1. <input checked="" type="checkbox"/> fee calculation sheet</td> <td style="width: 20%; text-align: right;">: 1</td> </tr> <tr> <td>2. <input checked="" type="checkbox"/> original separate power of attorney</td> <td style="text-align: right;">: 1</td> </tr> <tr> <td>3. <input type="checkbox"/> original general power of attorney</td> <td style="text-align: right;">:</td> </tr> <tr> <td>4. <input type="checkbox"/> copy of general power of attorney; reference number, if any: _____</td> <td style="text-align: right;">:</td> </tr> <tr> <td>5. <input type="checkbox"/> statement explaining lack of signature</td> <td style="text-align: right;">:</td> </tr> <tr> <td>6. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s): _____</td> <td style="text-align: right;">:</td> </tr> <tr> <td>7. <input type="checkbox"/> translation of international application into (language): _____</td> <td style="text-align: right;">:</td> </tr> <tr> <td>8. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material</td> <td style="text-align: right;">:</td> </tr> <tr> <td>9. <input type="checkbox"/> sequence listing in computer readable form (indicate also type and number of carriers (diskette, CD-ROM, CD-R or other))</td> <td style="text-align: right;">:</td> </tr> <tr> <td style="padding-left: 20px;">(i) <input type="checkbox"/> copy submitted for the purposes of international search under Rule 13ter only (and not as part of the international application)</td> <td style="text-align: right;">:</td> </tr> <tr> <td style="padding-left: 20px;">(ii) <input type="checkbox"/> (only where check-box (b)(i) or (b)(ii) is marked in left column) additional copies including, where applicable, the copy for the purposes of international search under Rule 13ter</td> <td style="text-align: right;">:</td> </tr> <tr> <td style="padding-left: 20px;">(iii) <input type="checkbox"/> together with relevant statement as to the identity of the copy or copies with the sequence listing part mentioned in left column</td> <td style="text-align: right;">:</td> </tr> <tr> <td>10. <input type="checkbox"/> other (specify): _____</td> <td style="text-align: right;">:</td> </tr> </table>	1. <input checked="" type="checkbox"/> fee calculation sheet	: 1	2. <input checked="" type="checkbox"/> original separate power of attorney	: 1	3. <input type="checkbox"/> original general power of attorney	:	4. <input type="checkbox"/> copy of general power of attorney; reference number, if any: _____	:	5. <input type="checkbox"/> statement explaining lack of signature	:	6. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s): _____	:	7. <input type="checkbox"/> translation of international application into (language): _____	:	8. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material	:	9. <input type="checkbox"/> sequence listing in computer readable form (indicate also type and number of carriers (diskette, CD-ROM, CD-R or other))	:	(i) <input type="checkbox"/> copy submitted for the purposes of international search under Rule 13ter only (and not as part of the international application)	:	(ii) <input type="checkbox"/> (only where check-box (b)(i) or (b)(ii) is marked in left column) additional copies including, where applicable, the copy for the purposes of international search under Rule 13ter	:	(iii) <input type="checkbox"/> together with relevant statement as to the identity of the copy or copies with the sequence listing part mentioned in left column	:	10. <input type="checkbox"/> other (specify): _____	:
1. <input checked="" type="checkbox"/> fee calculation sheet	: 1																										
2. <input checked="" type="checkbox"/> original separate power of attorney	: 1																										
3. <input type="checkbox"/> original general power of attorney	:																										
4. <input type="checkbox"/> copy of general power of attorney; reference number, if any: _____	:																										
5. <input type="checkbox"/> statement explaining lack of signature	:																										
6. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s): _____	:																										
7. <input type="checkbox"/> translation of international application into (language): _____	:																										
8. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material	:																										
9. <input type="checkbox"/> sequence listing in computer readable form (indicate also type and number of carriers (diskette, CD-ROM, CD-R or other))	:																										
(i) <input type="checkbox"/> copy submitted for the purposes of international search under Rule 13ter only (and not as part of the international application)	:																										
(ii) <input type="checkbox"/> (only where check-box (b)(i) or (b)(ii) is marked in left column) additional copies including, where applicable, the copy for the purposes of international search under Rule 13ter	:																										
(iii) <input type="checkbox"/> together with relevant statement as to the identity of the copy or copies with the sequence listing part mentioned in left column	:																										
10. <input type="checkbox"/> other (specify): _____	:																										
<p>Figure of the drawings which should accompany the abstract: FIG. 8</p>	<p>Language of filing of the international application: EN</p>																										
<p><b>Box No. X SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE</b></p> <p><i>Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).</i></p> <div style="text-align: center; margin-top: 20px;">  </div>																											

For receiving Office use only		
1. Date of actual receipt of the purported international application:	12 MAY 2003 (12.05.03)	<p>2. Drawings:</p> <p><input type="checkbox"/> received:</p> <p><input type="checkbox"/> not received:</p>
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:		
4. Date of timely receipt of the required corrections under PCT Article 11(2):		
5. International Searching Authority (if two or more are competent): ISA /	6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid	
For International Bureau use only		
<p>Date of receipt of the record copy by the International Bureau: _____</p>		

This sheet is not part of and does not count as a sheet of the international application.

PCT

FEE CALCULATION SHEET

Annex to the Request

For receiving Office use only

PCT/CN 03/ 0 03 3 9

International Application No.

12 MAY 2003 (12.05.03)

Date stamp of the receiving Office

Applicant's or agent's  
file reference

FPEL03150016

Applicant

SAE MAGNETICS (H.K.) LTD.

CALCULATION OF PRESCRIBED FEES

1. TRANSMITTAL FEE

CNY500

T

2. SEARCH FEE

CNY1500

S

International search to be carried out by

(If two or more International Searching Authorities are competent to carry out the international search, indicate the name of the Authority which is chosen to carry out the international search.)

3. INTERNATIONAL FEE

Basic Fee

Where item (b) of Box No. IX applies, enter Sub-total number of sheets

27

Where item (b) of Box No. IX does not apply, enter Total number of sheets

b1 first 30 sheets

CHF650

b1

b2

number of sheets  
in excess of 30

x

fee per sheet

=

b2

b3 additional component (only if sequence listing part of description is filed in computer readable form under Section 801(a)(i), or both in that form and on paper, under Section 801(a)(ii)):

400 x

fee per sheet

=

b3

Add amounts entered at b1, b2 and b3 and enter total at B

CHF650

B

Designation Fees

The international application contains 1 designations.

1

CHF140

x

CHF140

D

number of designation fees  
payable (maximum 5)

amount of designation fee

Add amounts entered at B and D and enter total at I

CHF790

I

(Applicants from certain States are entitled to a reduction of 75% of the international fee. Where the applicant is (or all applicants are) so entitled, the total to be entered at I is 25% of the sum of the amounts entered at B and D.)

P

4. FEE FOR PRIORITY DOCUMENT (if applicable)

CNY2000CHF790

5. TOTAL FEES PAYABLE

TOTAL

Add amounts entered at T, S, I and P, and enter total in the TOTAL box

☐ The designation fees are not paid at this time.

MODE OF PAYMENT

☒ authorization to charge  
deposit account (see below)

☐ postal money order

☐ cash

☐ coupons

☐ cheque

☐ bank draft

☐ revenue stamps

☐ other (specify):

AUTHORIZATION TO CHARGE (OR CREDIT) DEPOSIT ACCOUNT

(This mode of payment may not be available at all receiving Offices)

☒ Authorization to charge the total fees indicated above.

☒ (This check-box may be marked only if the conditions for deposit accounts of the receiving Office so permit) Authorization to charge any deficiency or credit any overpayment in the total fees indicated above.

☐ Authorization to charge the fee for priority document.

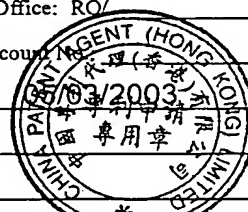
Receiving Office: RO/

Deposit Account No.

Date:

Name:

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## SYSTEM AND METHOD FOR EDGE BLENDING HARD DRIVE HEAD SLIDERS

### Background Information

5 [0001] The present invention relates to hard disk drives. More specifically, the invention relates to a system and method for edge blending hard drive head sliders.

[0002] Figure 1 provides an illustration of a typical hard disk drive. Hard disk drive storage devices typically include a rotating disk 1 mounted for rotation by a spindle motor (not shown). A slider 3, supported by a suspension arm 5, 'flies' over the  
10 surface of the magnetic disk 1 at a high velocity, reading data from and writing data to concentric data tracks 11 on the disk 1. The slider 1 is positioned radially by a voice coil motor 7.

[0003] Figure 2 shows a more detailed view of a head slider 3 flying over the surface of a magnetic disk 1 as is typical in the art. Modern head sliders 3 float over the  
15 surface of the disk 1 on a cushion of air. If the 'flying height' is too great, the head 12 on the head slider cannot properly read from and write to the disk 1. If it is too small, there is an increased chance of a head crash.

[0004] If a head slider 3 contacts the surface of the disk while it is at operational speed, the result can be a loss of data, damage to the head slider, damage to the surface  
20 of the disk 1, or all three. One of the most common causes of head crashes is a contaminant getting wedged in the microscopic gap between head 3 and disk 1. Head sliders 3 are typically ceramic for durability and corrosion resistance. A ceramic slider is durable due to its hardness. The tradeoff, however, of ceramic's hardness is its brittleness. When a row bar is cut into individual sliders 3 (explained below), the  
25 ceramic crystal array causes the slider 3 edges to crack easily. Loose chips of ceramic material may be found on the cutting surface edge corners even after solvent cleaning. Also, after cutting a row bar into individual sliders, a high point is often left on the cut slider surface. This is known as 'edge jump'. Edge jump is believed to be from the stress applied to the cut edge of the slider 3. A deformation layer is created by the



pressure 20 created by the cutting process. (See Figure 3).

[0005] Figure 3 illustrates the problems related to particle contamination and edge jump as is typical in the art. The problems concerning loose chips 21 and edge jump 20 can cause hard drive head crashes. A loose chip 21 may fall from the slider and contaminate the interface between the slider 3 and disk 1. An edge jump 20 can affect a slider's anti-shock performance negatively. If the HDD gets a physical impact while operating, a location of edge jump may contact and damage the disk 1.

[0006] It is therefore desirable to have a system and method for edge blending hard drive head sliders, that avoids the above-mentioned problems, as well as having additional benefits.

Brief Description Of The Drawings

[0007] Figure 1 provides an illustration of a typical hard disk drive.

[0008] Figure 2 shows a more detailed view of a head slider flying over the surface of a magnetic disk as is typical in the art.

5 [0009] Figure 3 illustrates the problems related to particle contamination and edge jump as is typical in the art.

[0010] Figure 4 illustrates a head parting jig as is typical in the art.

[0011] Figure 5 illustrates an edge blending jig according to an embodiment of the present invention.

10 [0012] Figure 6 illustrates the attachment of a head blending jig to a head blending machine according to an embodiment of the present invention.

[0013] Figure 7 illustrates portions of lapping tape inserted between individual head sliders mounted to an edge blending jig in a standby configuration and in two edge blending configurations according to an embodiment of the present invention.

15 [0014] Figure 8 provides a more detailed illustration of lapping tape partially wrapping a slider's edge to perform edge blending according to an embodiment of the present invention.

[0015] Figure 9 provides a detailed view of an individual slider mounted to an arm of an edge blending jig with lapping tape partially wrapping a slider edge for edge  
20 blending according to an embodiment of the present invention.

[0016] Figure 10 illustrates an edge blending machine according to an embodiment of the present invention.

### Detailed Description

[0017] Figure 4 illustrates head parting jig as is typical in the art. As is illustrated in figure 4a, a slider row bar 401 is typically bonded to multiple arms 402 of a head parting jig 403. As is illustrated in figure 4b and described further below, the row bar is cut into individual head sliders 3 by a slider parting tool (not shown).

[0018] Figure 5 illustrates an edge blending jig according to an embodiment of the present invention. As illustrated in Figure 5a, in one embodiment, a slider row bar 501 is bonded to multiple arms 502 of the edge blending jig, whereupon the row bar is separated into individual head sliders 3 by a slider parting tool (not shown). One advantage of this jig design is that imperfections on the edges of the sliders 3 (such as edge jump) can be detected by viewing the sliders from behind 505 and observing the uniformity of gaps between the sliders 3.

[0019] Figure 6 illustrates the attachment of a head blending jig to a head blending machine according to an embodiment of the present invention. In one embodiment, the edge blending jig is coupled to a support assembly 12 of the head blending machine by a pair of pins 11.

[0020] Figure 7 illustrates portions of lapping tape inserted between individual head sliders mounted to an edge blending jig in a 'standby' configuration and in two edge blending configurations according to an embodiment of the present invention. As illustrated in figure 7a, in one embodiment, lapping tape 701 covered with an abrasive, such as diamond powder (*e.g.*, of a grade between 0.1 microns and 3.0 microns), is inserted between sliders 3. Figure 7a shows the edge blending assembly in a 'standby' configuration with the sliders 3 out of contact with the lapping tape 701. Figure 7b shows the edge blending assembly configured to partially wrap the lapping tape 701 across one of the edges of each slider 3 on the edge blending jig 2 according to an embodiment of the present invention. In this embodiment, the lapping tape is positioned by an adjustable series of rollers (described below) to be stretched across the slider edges at a predetermined tension force (*e.g.*, less than 0.8 kilograms). In this embodiment, the edge blending jig 2 is directionally oscillated 712 by the edge

blending assembly to cause relative motion between the sliders 3 and the lapping tape 701 (*e.g.*, at a frequency of at least 1 cycle per second and at an amplitude between 10 millimeters and 40 millimeters). Figure 7c shows the edge blending assembly configured to partially wrap the lapping tape 701 across the opposite edge of each slider 3 according to an embodiment of the present invention. In this embodiment, the edge blending assembly is configured to stretch the lapping tape 701 across the opposite edge of each slider to complete the edge blending process. As explained below, in one embodiment, the process of edge blending is performed submerged in lubricant.

[0021] Figure 8 provides a more detailed illustration of lapping tape partially wrapping a slider's edge to perform edge blending according to an embodiment of the present invention. In one embodiment, a first angle ( $\alpha$ ) is formed between a face 805 of the slider 3 and the lapping tape 801, and a second angle ( $\beta$ ) is formed between the opposite face 806 of the slider 3 and the lapping tape 801 ( $\alpha$  and  $\beta$  being between 3 degrees and 90 degrees, for example).

[0022] Figure 9 provides a detailed view of an individual slider mounted to an arm of an edge blending jig with lapping tape partially wrapping a slider edge for edge blending according to an embodiment of the present invention. In one embodiment, after a row bar is bonded to multiple arms of an edge blending jig 2 (by, *e.g.*, epoxy) and cut into individual mounted sliders 3 (such as by a diamond cutting wheel), lapping tape 1 is inserted between the sliders 3 and the edge blending assembly is configured to wrap the lapping tape 1 around an edge of the slider 3 under a predetermined amount of tensile force. As stated above, in this embodiment, the slider 3 is directionally oscillated to achieve relative motion between the slider 3 and the lapping tape 1.

[0023] Figure 10 illustrates an edge blending machine according to an embodiment of the present invention. In one embodiment, an edge blending jig with mounted sliders is coupled to a jig support 5 and mounted in the edge blending machine. In this embodiment, a top platform 4, containing lapping tape rollers 16, is attached to a base unit 9, supporting the edge blending jig. In this embodiment, portions of lap tape 1001 are positioned and kept in alignment by a series of guide arms 17. In this embodiment

a spring mechanism 6, which is adjusted by a tension adjustment knob 1002, is utilized to maintain the appropriate tensile force for the portions of lapping tape 1001. Maintaining appropriate lapping tape tension is important to prevent lapping tape 1001 breakage or dislodging of sliders from the edge blending jig arms.

5 [0024] In this embodiment, another adjustment knob 1003 is utilized to move the lapping tape portions relative to the sliders (on the edge blending jig) to shift the relative position to partially wrap the slider edges appropriately (to provide the appropriate angles of  $\alpha$  and  $\beta$ ). In this embodiment, the process of edge blending is performed with the edge blending assembly submerged in lubricant. In this  
10 embodiment, a reservoir 7 is filled above the level of the sliders with a lubricant (such as a mixture of de-ionized (DI) water and oil) before edge blending.

[0025] In one embodiment, rubber tape is used instead of the lapping tape with the reservoir 7 filled with a diamond slurry. In this embodiment, the diamond particles travel on the rubber tape as an abrasive to smooth the slider edge's surface. Also, in  
15 an embodiment, a cleaning process could be performed after edge blending, wherein the lapping tape 1001 is replaced with rubber tape and the reservoir 7 is filled with a cleaning solution. The slider would be oscillated with respect to the rubber tape in the cleaning solution to clean any debris left on the sliders after the edge blending process.

[0026] Although several embodiments are specifically illustrated and described herein,  
20 it will be appreciated that modifications and variations of the present invention are covered by the above teachings and within the purview of the appended claims without departing from the spirit and intended scope of the invention.

What is Claimed is

1. A system for manufacturing a hard disk drive head slider comprising:

an edge blending jig of an edge blending assembly to bond to a number of head  
5 sliders for edge blending, said edge blending by lapping tape, wherein

said edge blending jig is configured to receive a portion of lapping tape between  
each of a number of said sliders;

said edge blending jig is configured to allow said lapping tape to partially wrap an  
edge of each slider; and

10 said edge blending is performed by relative movement between said sliders and  
said lapping tape.

2. The system of claim 1, wherein said edge blending is by directional oscillation of  
said sliders with respect to said lapping tape.

15 3. The system of claim 2, wherein said oscillation of the sliders is at a frequency of at  
least 1 cycle per second.

4. The system of claim 2, wherein said oscillation of the sliders is at an amplitude of at  
20 least 10 millimeters.

5. The system of claim 2, wherein said slider oscillation is performed with a first angle  
( $\alpha$ ) between a first face of the slider and the lapping tape and with a second angle ( $\beta$ )  
between a second face of the slider and the lapping tape, said first angle and said second  
25 angle each being between 3 degrees and 90 degrees.

6. The system of claim 2, wherein said slider oscillation is performed with a portion of  
lapping tape partially wrapped around an edge of each slider under a tension force of at  
least 0.05 kilograms.

7. The system of claim 2, wherein said edge blending is performed with said sliders and said lapping tape submerged in a lubricant.

8. The system of claim 2, wherein said lapping tape has a lapping surface covered with  
5 an inorganic powder.

9. The system of claim 8, wherein said inorganic powder is diamond powder.

10. The system of claim 8, wherein said powder has a grade between 0.1 microns and  
10 3.0 microns.

11. The system of claim 2, wherein said lapping tape has a thickness between 40 microns and 100 microns.

12. The system of claim 2, wherein said lapping tape is greater than 1.2 millimeters in  
15 width.

13. The system of claim 2, wherein a slider row bar is to be bonded to said edge  
blending jig, said row bar to be separated into individual head sliders upon the edge  
20 blending jig.

14. The system of claim 13, wherein said row bar is to be separated into individual sliders by a diamond cutting wheel.

15. The system of claim 2, wherein for a slider cleaning process said lapping tape is a  
25 rubber tape and said oscillation is performed with said sliders and said rubber tape submerged in a cleaning solution.

16. The system of claim 15, wherein said cleaning process is performed for at least 30

seconds.

17. The system of claim 2, wherein said lapping tape is a rubber tape and said oscillation is performed with said sliders and said rubber tape submerged in a diamond  
5 slurry.

18. A method for manufacturing a hard disk drive head slider comprising:

inserting lapping tape between each of a number of head sliders bonded to a edge  
blending jig of an edge blending assembly;

10 adjusting said edge blending assembly to cause the lapping tape to partially wrap  
an edge of each slider; and

edge blending said head sliders by relative movement between said sliders and  
said lapping tape.

15 19. The method of claim 18, wherein said edge blending is by directional oscillation of  
said sliders with respect to said lapping tape.

20. The method of claim 19, wherein said oscillation of the sliders is at a frequency of  
at least 1 cycle per second and an amplitude of at least 10 millimeters.

20 21. The method of claim 19, wherein said slider oscillation is performed with a first  
angle ( $\alpha$ ) between a first face of the slider and the lapping tape and with a second angle  
( $\beta$ ) between a second face of the slider and the lapping tape, said first angle and said  
second angle each being between 3 degrees and 90 degrees.

25 22. The method of claim 19, wherein said slider oscillation is performed with a portion  
of lapping tape partially wrapped around an edge of each slider under a tension force of  
at least 0.05 kilograms.



23. The method of claim 19, wherein said edge blending is performed with said sliders and said lapping tape submerged in a lubricant.

24. The method of claim 19, wherein said lapping tape has a lapping surface covered  
5 with a diamond powder having a grade between 0.1 microns and 3.0 microns.

25. The method of claim 19, wherein said lapping tape has a thickness between 40 microns and 100 microns.

10 26. The method of claim 19, further comprising:  
bonding a head slider row bar to said edge blending jig; and  
separating said row bar into said number of head sliders.

15 27. The method of claim 26, wherein said separating said row bar is performed by a slider parting tool.

28. The method of claim 19, wherein for a slider cleaning process said lapping tape is a rubber tape and said oscillation is performed with said sliders and said rubber tape submerged in a cleaning solution.

20 29. The method of claim 28, wherein said cleaning process is performed for at least 30 seconds.

30. The method of claim 19, wherein said lapping tape is a rubber tape and said  
25 oscillation is performed with said sliders and said rubber tape submerged in a diamond slurry.

31. A method for manufacturing a hard disk drive head slider comprising:  
bonding a head slider row bar to a edge blending jig of an edge blending assembly;

separating upon the edge blending jig the row bar into a number of head sliders;

inserting lapping tape between each slider on the edge blending jig;

adjusting said edge blending assembly to cause the lapping tape to partially wrap  
an edge of each slider; and

5       edge blending said head sliders by motion oscillation of said sliders with respect to  
said lapping tape.

## Abstract

A system and method are disclosed for edge blending hard drive head sliders by oscillating abrasive lapping tape across the edges of multiple sliders simultaneously.

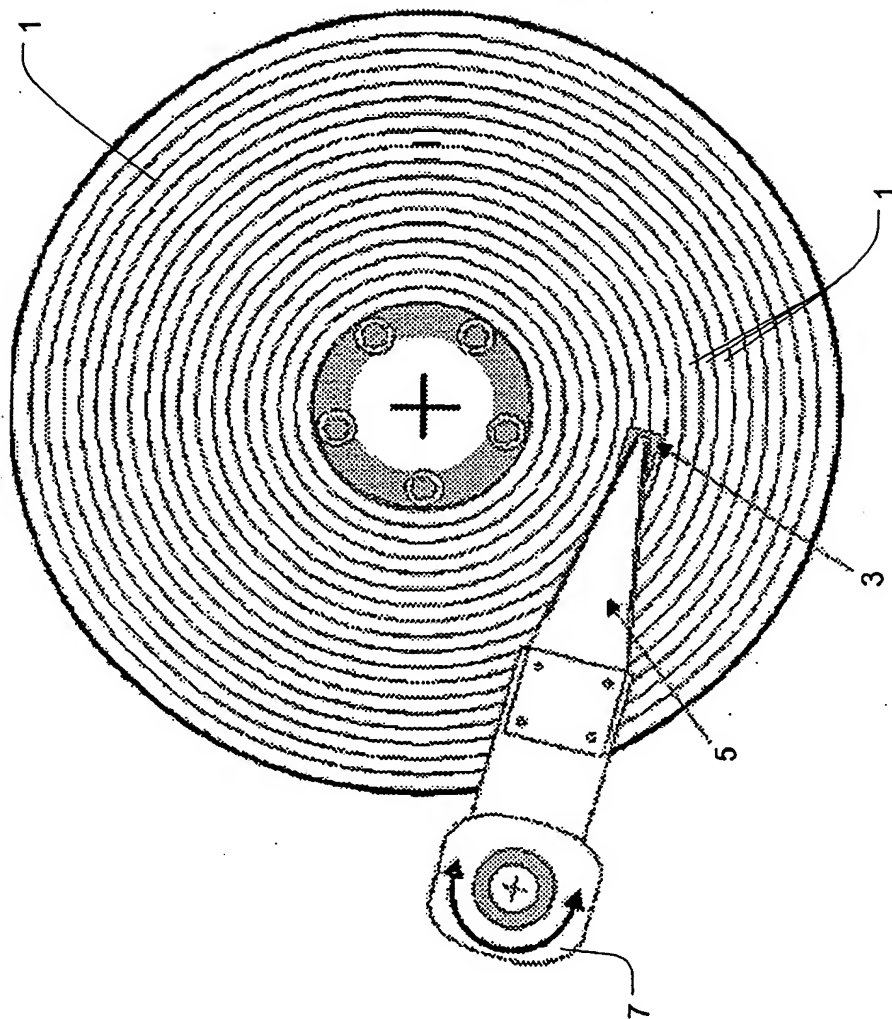


FIG. 1  
(Prior Art)

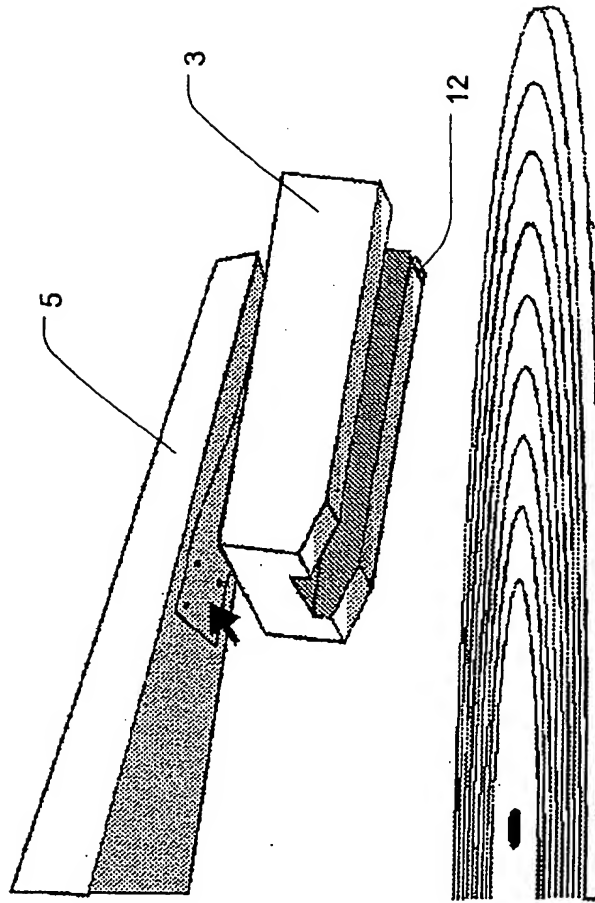


FIG. 2  
(Prior Art)

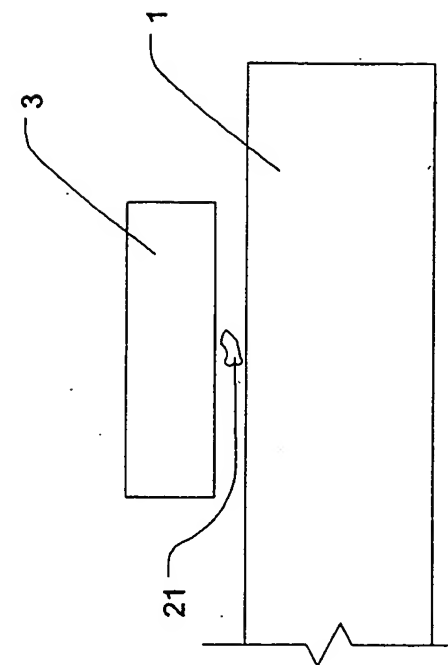


FIG. 3b

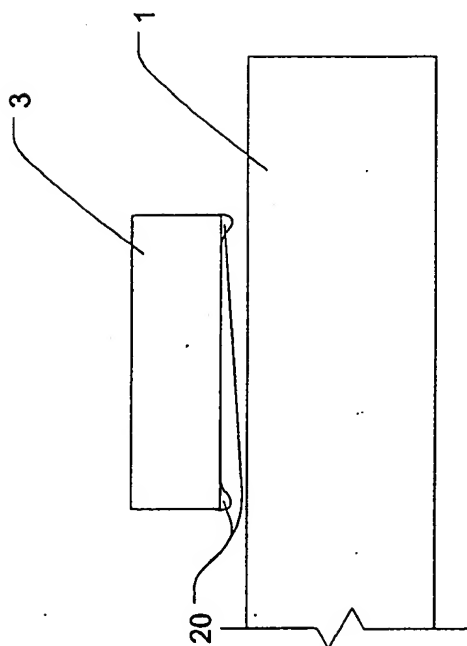


FIG. 3a

FIG. 3  
(Prior Art)

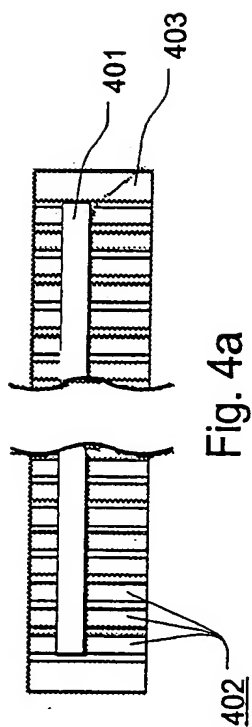


Fig. 4a

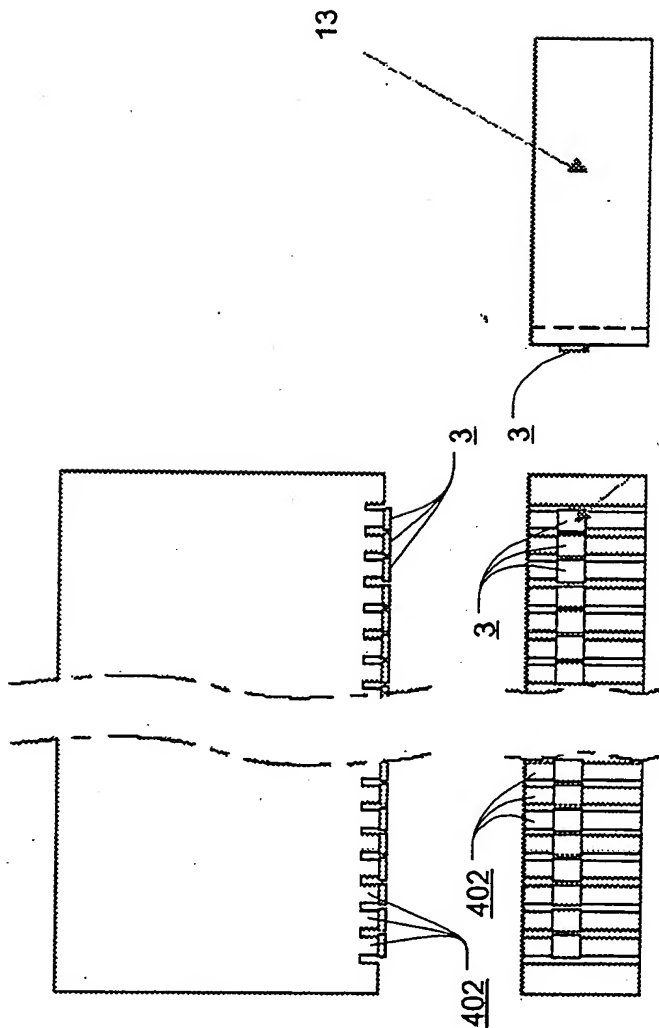


Fig. 4b

FIG. 4

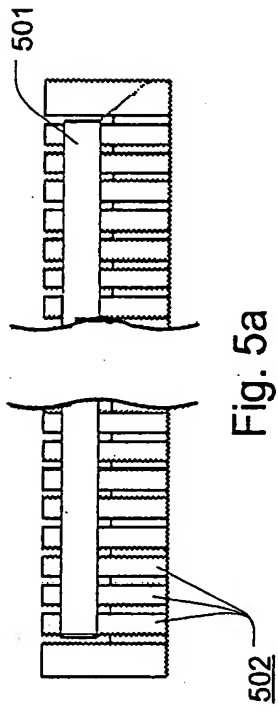


Fig. 5a

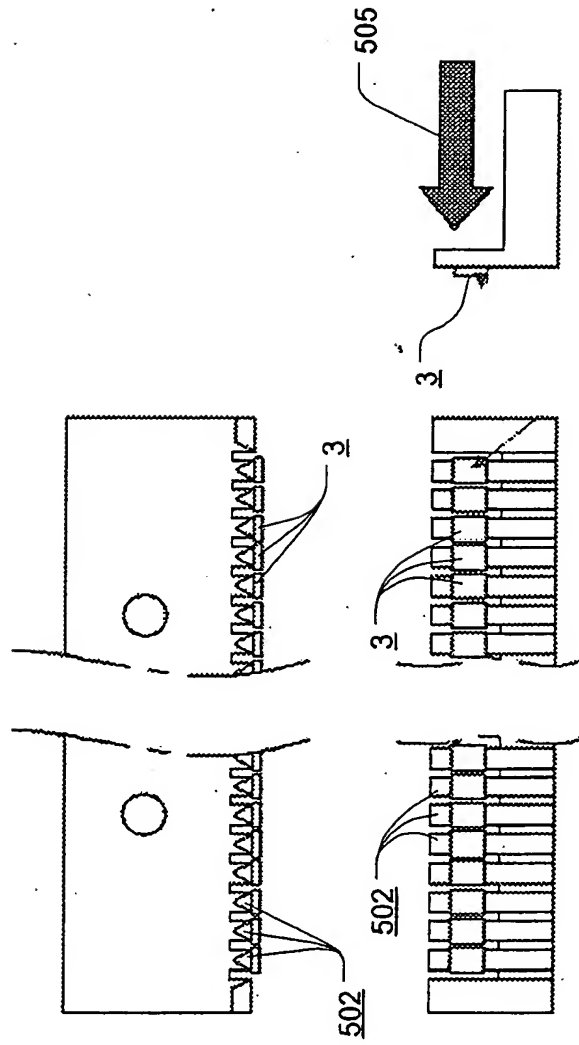


Fig. 5b  
FIG. 5



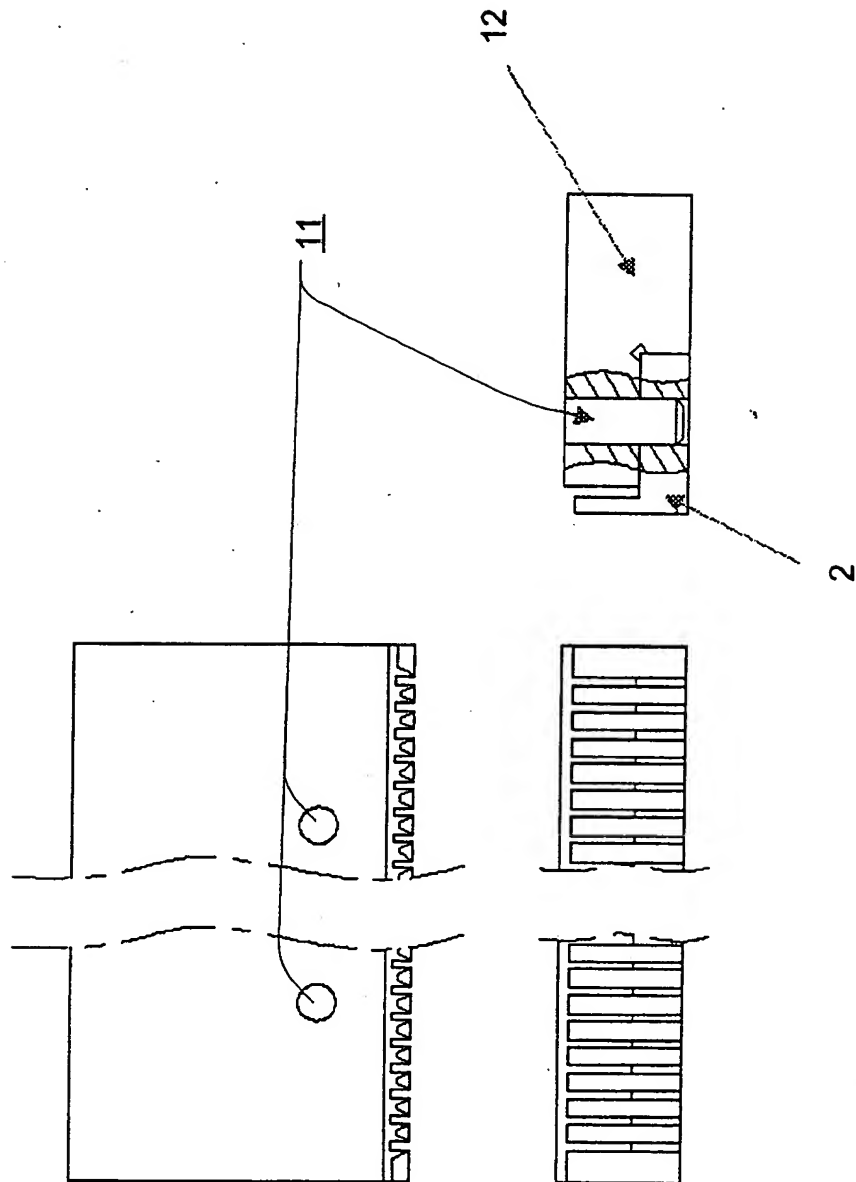


FIG. 6

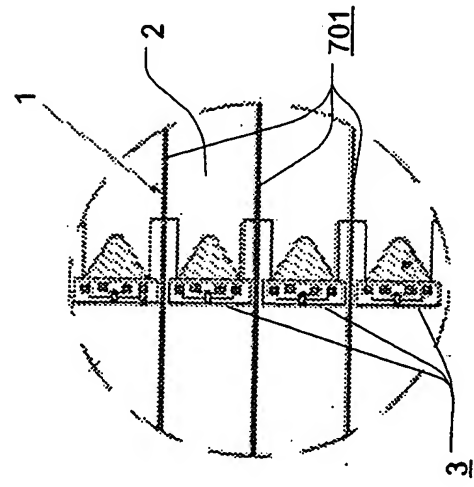


Fig. 7a

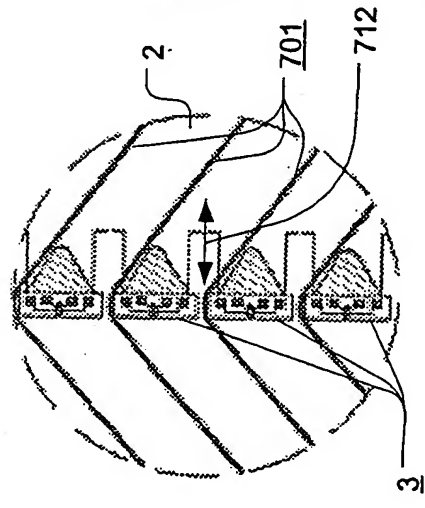


Fig. 7b

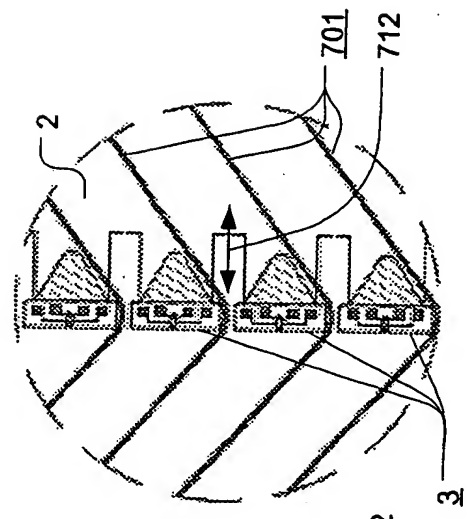


Fig. 7c

FIG. 7

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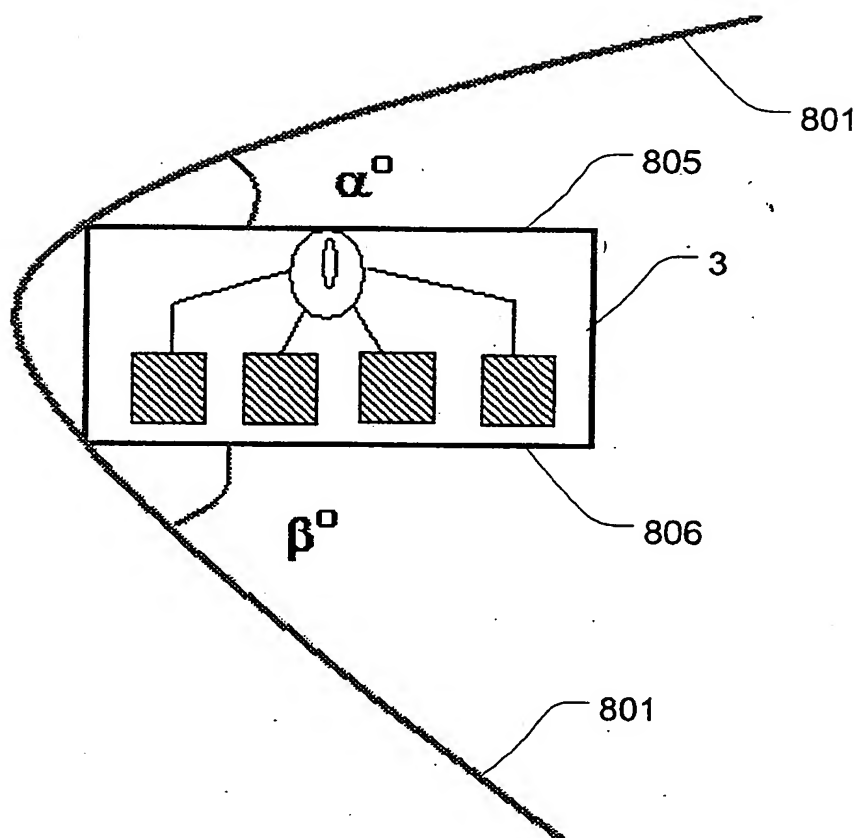


FIG. 8

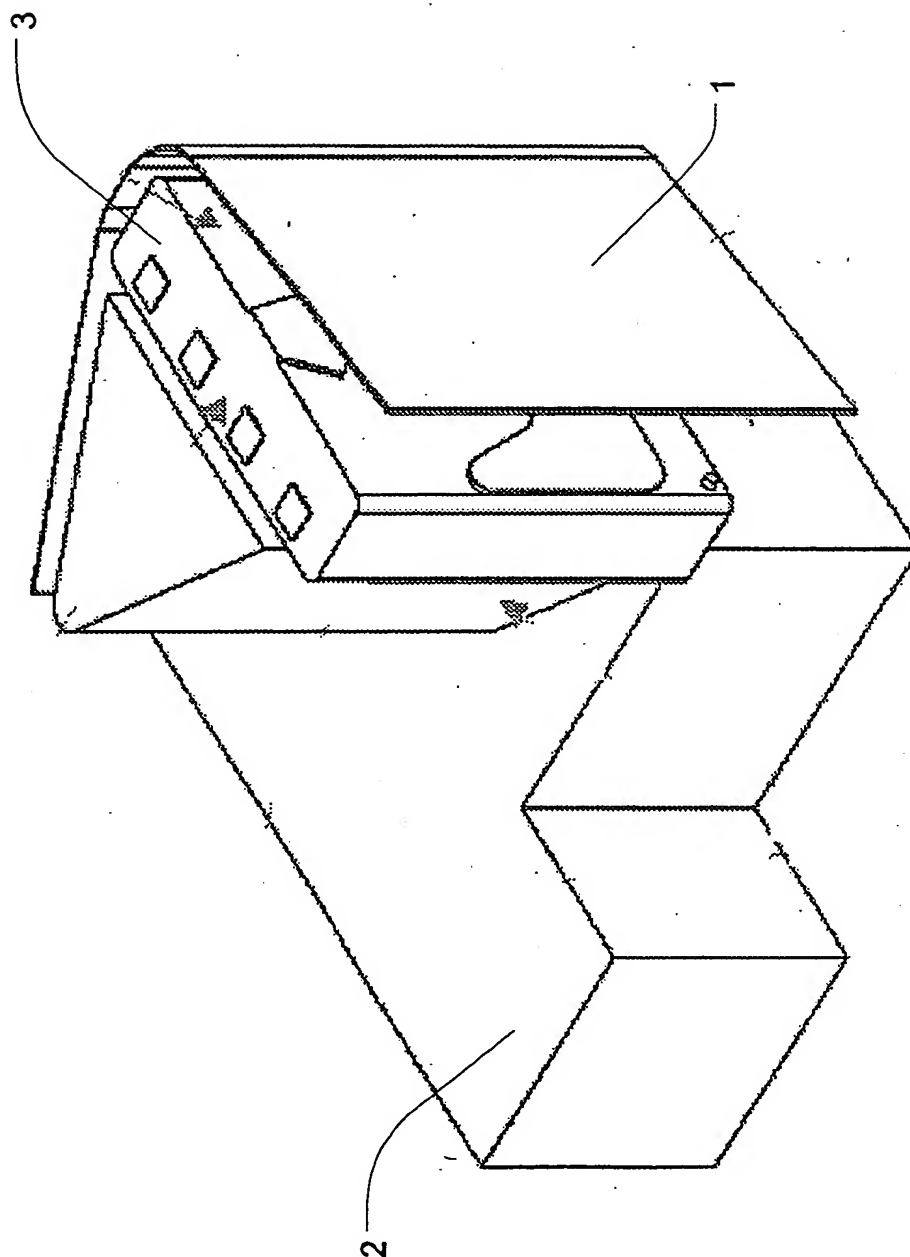


FIG. 9

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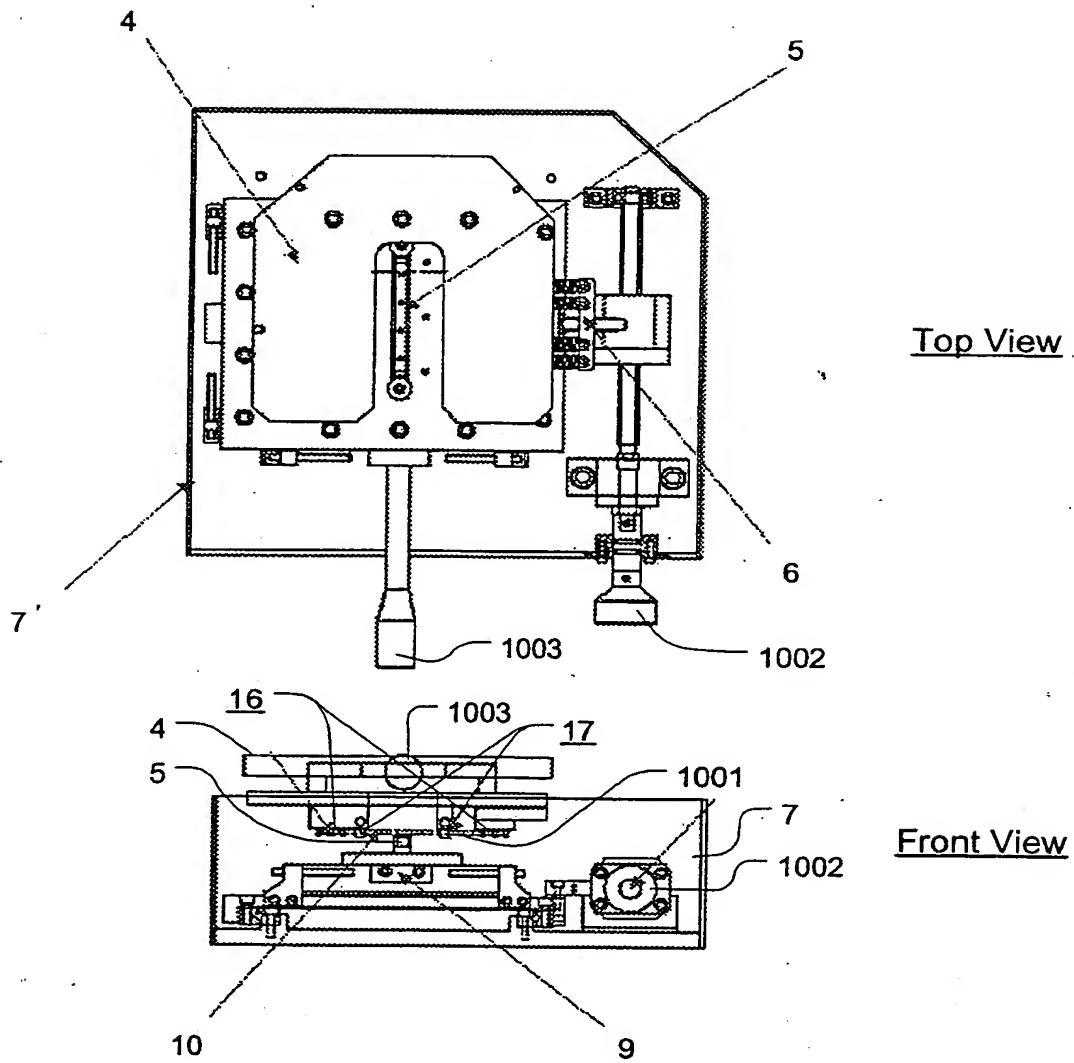


FIG. 10